Claims

1. A magnetoelectric device responsive to an applied magnetic field, comprising first and second ferromagnetic regions with a channel region between them, the ferromagnetic regions being configured so that charge carriers with a particular spin polarisation which can pass through the first region, pass through the second region as a function of the relative orientations of magnetisation of the ferromagnetic regions produced by the applied magnetic field whereby the device exhibits a conductivity as a function of the strength of the applied field, the channel region being configured to provide a quasi-one-dimensional channel to cause charge carriers which pass through the first ferromagnetic region to maintain their spin polarisation as they pass towards the second ferromagnetic region.

2. A magnetoelectric device according to claim 1 wherein the channel region includes a nanotube.

3. A magnetoelectric device according to claim 2 wherein the channel region comprises a bundle of nanotubes.

4. A magnetoelectric device according to claim 2 wherein the ~~or each~~ nanotube is made of carbon.

5. A magnetoelectric device according to claim 1 wherein the channel region includes a layer of carbon containing material.

6. A magnetoelectric device according to claim 3 wherein the channel region comprises a layer of graphite.

7. A magnetoelectric device according to claim 3 wherein the channel region comprises a diamond layer.

8. A magnetoelectric device responsive to an applied magnetic field, comprising first and second ferromagnetic regions with a channel region between them, wherein the channel region includes a carbon containing material.

9. A magnetoelectric device according to claim 8 wherein the channel region includes a carbon nanotube.

10. A magnetoelectric device according to claim 9 wherein the channel region comprises a bundle of nanotubes.

11. A magnetoelectric device according to claim 8 wherein the channel region comprises a layer of graphite.

12. A magnetoelectric device according to claim 8 wherein the channel region comprises a diamond layer.

13. A magnetoelectric device responsive to an applied magnetic field, comprising first and second ferromagnetic regions with a channel region between them wherein the channel region includes a nanotube.

14. A magnetoelectric device according to claim 13 wherein the channel region comprises a bundle of nanotubes.

15. A magnetoelectric device according to claim 13 wherein the nanotube is made of carbon.

16. A magnetoelectric device according to claim 13 wherein the nanotube is formed of boron nitride.

17. A magnetoelectric device according to claim 13 wherein the nanotube is formed of silicon.

18. A magnetoelectric device according to claim 1 wherein the first and second ferromagnetic regions comprise layers on a common substrate.

19. A magnetoelectric device according to claim 18 wherein the substrate is made of a material selected from a group consisting of a metal, glass and silicon, and covered with an insulating layer on which the ferromagnetic layers are formed.

20. A magnetoelectric device according to claim 19 wherein the insulating layer comprises a material selected from a group consisting of silicon oxide and silicon nitride.

21. A magnetoelectric device according to claim 1 wherein the first and second ferromagnetic regions are made of a cobalt containing material.

22. A magnetoelectric device according to claim 1 including a gate to apply a field to the channel region.

23. A magnetic reading head for reading data from magnetic storage media, the head including a magnetoelectric device according to claim 1, 8 or 13.